

## Claims

1. Method of training and diagnostic with the aim of identifying a current spectrum allowing to detect chemical and/or biological substances in the atmosphere via flame spectrophotometry, characterised in that it comprises the following steps:

- the analysis of the reduced data of the current spectrum in principal components;
- the creation of a matrix representing all the projections of the set of actives;
- the classification of all the projections of the set of actives into current groups;
- the evaluation of the potential of affiliation of the current spectrum in all the current groups;
- the affiliation of the current spectrum to one of the current groups of the set of actives if the potential of affiliation to said group of said current spectrum is greater than a pre-set threshold;
- the setting off of the alarm if one of the current groups of the set of actives has a frequency of appearance of the different elements of the group greater than a pre-set threshold,
- the remote rejection of the current spectrum and the agglomeration of one of the training groups, if said current spectrum is sufficiently different to extant forms so as to belong to a new group.

2. Method according to claim 1, characterised in that it firstly comprises the following steps:

- the modelling of the bottom of the flame (block 2);
- the deleting of the bottom of the flame at the current spectrum (block 3);
- the filtering of the obtained signal (block 4);
- the standardising of the filtered spectrum (block 5);

- the detecting of the current spectrum if the latter does not correspond to noise (block 6).

3. Method according to claim 1,

5 characterised in that the projection of the current spectrum (block 7), on all the projection axes comprises the estimation of the parameters of said spectrum with the use of a series of simple regressions between the data of said current spectrum and a part of its parameters.

10 4. Method according to one of claims 1 to 3,

characterised in that the evaluating of the potential of affiliation of the projected spectrum (block 8) in relation to the different spectrum groups constituting a set of actives organised in distinct groups, comprises the following conditions:

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- if the potential of affiliation of the current spectrum is greater than a pre-set threshold, said spectrum undergoes the step known as the diagnostic step (block 9),
- if the potential of affiliation of the current spectrum is less than a  
20 pre-set rejection threshold, said spectrum undergoes the step known as the coalescence step (block 10),
- if the potential of affiliation of the current spectrum is greater than the rejection threshold and less than an acceptance threshold, there is an ambiguity; the current spectrum is directed toward a repeat pre-  
25 processing.

5. Method according to claim 4,

characterised in that the diagnostic comprises the calculation of the frequency of appearances of the different elements of the group constituted of the  
30 spectrums detected and determining if the warning level has been reached by one of the groups of the set of actives.

6. Method according to claim 5,  
characterised in that it comprises the identifying of the diagnosed spectrum  
when the sum of the diagnostics is greater than a pre-set threshold.

5           7. Method according to claim 4,  
characterised in that the coalescence comprises the agglomeration of the  
current spectrum with one of the training groups (block 11) or the creation of a  
new group (block 12).

10           8. Method according to claim 7,  
characterised in that it comprises a threshold detection (block 13) that defines  
a minimal size for the training groups.

              9. Method according to claim 8,  
15 characterised in that it comprises the integration of the training groups with the  
set of actives when the threshold has been reached.

              10. Method according to claim 1,  
characterised in that it comprises a bi-directional chained list representing all  
20 of the groups, each group being defined by its identifier and its content; the  
inserting of a new group being performed following the destruction of the  
oldest group.

              11. Method according to claim 10,  
25 characterised in that the chained list comprises indestructible groups.